AMATEUR SATELLITE REPORT

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AMSAT® NA *Newsletter for the Amateur Radio Space Program*

Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

TAPR Supports No-Code Amateur Radio License

The following is reprinted from the February *TAPR Packet Status Register (PSR):*

PRESIDENTS CORNER

Andy Freeborn, NØCCZ

About five years ago the FCC proposed a class of Amateur license which provided that entitlement to that class of license did not require a knowledge of Morse code. Maybe it was the sentiment of the time, maybe it was the manner in which the proposal was presented, maybe it was the phase of the moon; any number of things may have affected, and likely did affect, the reaction of Amateurs at that time. That was five years ago. Five years can be an eternity in today's rapidly changing world. At the beginning of 1983 there were just a few hundred Amateurs worldwide who were experimenting with packet radio. Observe the change.

The reaction of many Amateurs and the ARRL to the FCC proposal was sufficiently strong that the FCC took no action to implement no-code licensing.

Much has happened in the interim. There have been many technological advances in Amateur Radio. Many of these advances are geared to the use of the higher Amateur frequency bands that are now under-utilized. The FCC has demonstrated that our frequency bands are vulnerable if not utilized. One need only look back a few months to see what happened to our 220-222 MHz segment.

Should we have been surprised at the outcome of the 220 battle? Read the following quote from a no-code discussion on Compuserve and judge for yourself.

".....I would like to make you aware of a public statement by Robert Foosaner, then Chief of the FCC's Personal Radio Bureau, while addressing the FCC Forum at the 1984 ARRL National Convention in New York City:

"Amateurs have made it abundantly clear that there is no room within Amateur Radio for a code-free license. THEREFORE (emphasis his), we are forced to consider the 220-MHz band as a possible candidate for reassignment to the Land Mobile Service." He then repeated himself for emphasis. I know what was said; I was there, in the front row."

It is time again to evaluate where we stand on the no-code issue. It is time to set emotions aside. It is time to take a hard-nosed look at the future of Amateur Radio with respect to our recent spectrum losses. It is time to evaluate past growth of Amateur Radio. It is time to take a businesslike look at our assets (the Amateur spectrum).

Larry Price, W4RA, and David Sumner, K1ZZ, President and Executive Vice President of the ARRL respectively, have opened the no-code discussion in the January issue of *QST* with their editorial in the "It Seems to Us ..." column. If you have not seen it already I commend it to you.

The Directors of Tucson Amateur Packet Radio have voted to support an Amateur initiated no-code proposal. Your Board feels that the proper approach to attain this objective is to work with and through the ARRL.

If you have been opposed to no-code in the past, now is the time to open your mind, listen to new ideas and thoughts on the matter, consider recent Amateur history and trends and THEN inform your ARRL Division Director of your views.

Editorial ...
"The Ughknown"

by Dr. John Champa, K8OCL

No, the title of this editorial is not a typo. It's the word used by the main author of a book I just read which I highly recommend for your consideration and reading enjoyment (*Yeager — An Autobiography* by General Chuck Yeager and Leo Janos, Bantam Books, Toronto, 1985). What the author was describing with this term was the feeling of dread experienced in facing an endeavor which is both worthwhile and potentially risky. That's what we're facing now as we enter a new era in the Amateur Radio Space Program.

AMSAT is about to launch four new OSCAR Satellites this summer; the MicroSats. These powerful and efficient new birds will open a whole new realm in the development of the Amateur Satellite Service. These birds will provide fascinating digital communications. The effort associated with their launch, testing, operation, and evaluation, is helping pave the way for the AMSAT Phase IV-A Geostationary Satellite Project.

As with all great progress, there are unavoidable risks to

take and a price to be paid. AMSAT has *never* missed a launch date. Keeping that important commitment has been demanding of our talented volunteers, and expensive. Even with tough budget controls in place, the treasury is the lowest it has been in years!

You have recently received, or will soon receive, a letter from Doug Loughmiller, KO5I, our President. He is asking for your much needed support during this challenging financial period in our organization's history (AMSAT will be twenty years old this Fall). I strongly urge you to continue to support the engineering and construction of this new generation of Amateur satellites. For those members in the United States, donations are tax-deductible because AMSAT is a tax-exempt, nonprofit, scientific and educational organization (IRS 501c3 — see your tax advisor for details). Think of it this way, most of us wouldn't think it unusual to donate at least $20 to help support major developments involving a favorite FM repeater group. Do the same for the best "repeater group" in the world!

If you have comments on this editorial, please send them to John Champa, K8OCL, AMSAT Executive Vice President, 7800 Hartwell Street, Dearborn, MI 48126-1122.

New Tracking Software Announced by AMSAT-UK

Satscan-II was recently released in England by AMSAT-UK for use on PC compatibles. This package was written by Trevor Stockill, G4GPQ. The software incorporates full graphics display of the world, and the map is in full color. The map display works with EGA and VGA modes only. All Keplerian elements can be entered by hand from the user-friendly menus.

Satscan-II is loaded with user-friendly menus and help screens to assist the user at every point. Most data can be sent to the screen, printer or to another disk file. The program gives the user the ability to compute mutual access windows between two, three or four different stations. There are many more useful elements contained in Satscan-II than can be mentioned in this short space.

In addition to the EGV/VGA world map display, there is a second comprehensive data display in tabular format. This format includes multiple satellites, azimuth and elevation data, and squint angles for each spacecraft in view. Also, information about a single satellite can be expanded to provide information about path losses, doppler shift, range, plus many more useful data points.

For current price information, or more details, send a self-addressed envelope to: AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ, England.

OSCAR-10 Operations

G. Ratcliff, VK5AGR

There appears to be some confusion amongst potential users of AO-10's transponder as to whether or not they are allowed to use the transponder after the 15th of February 1989. Therefore, after consulting with Ian Ashley, ZL1AOX, (who has been unable to monitor AO-10 due to work commitments) I have uploaded the following K & L blocks to AO-13's beacon which are transmitted at 400 baud PSK. I have also loaded a similar message for transmission on AO-13's beacon by RTTY and CW. Hopefully these messages will clarify the situation.

K de VK5AGR 17Feb89 2005 UTC QST: Please note that AO-10's transponder is available for use whenever in view. However, please **Do Not Use** the transponder when FMing occurs. AO-10 is not affected by eclipses until April 1989 but the solar illumination is dropping every day. The estimate of AO-10's attitude (extrapolating from the last known attitude before the IHU failed in December 1986) on 20Feb89 is LON 70 degrees LAT – 27 degrees which equates to a solar illumination of 60%. When the solar illumination drops below 70% AO-10's transponder will support only moderate usage. I would expect that by the end of February AO-10 will once again go 'dormant' until about the end of the first week of May when the estimated solar illumination will be greater than 60%. The estimate of AO-10's attitude on 08May89 is LON 63 degrees and LAT – 26.4 degrees which equates to a solar illumination of 64%. Please feel free to use AO-10's transponder until signals are FMing.

AO-10 Attitude

by Ross Forbes, WB6GFJ

To estimate the spacecraft's attitude as it goes about its regular orbit: The following data was taken from the AMSAT-AUSTRALIA Newsletter and was developed from data VK5AGR had from the last known attitude of OSCAR-10. It is the best estimate we have for right now.

Date	LON	LAT
1989 Feb 20	69.9	– 27.0
1989 Mar 20	67.4	– 27.0
1989 Apr 24	63.4	– 26.7

The program ATTHIST is in the final stages of conversion (and verification to be sure the conversion was correct) and will be made available in North America through Project OSCAR. I will provide details as soon as the program is ready.

N8IWJ is Recognized by ARRL and Fellow Teachers for SKITREK Efforts

Rich Ensign, N8IWJ, AMSAT-NA Science Education Advisor, was recently recognized by the ARRL Board of Directors for the outstanding job he did in bringing the world of amateur radio into school classrooms last year. Rich produced the AMSAT Teachers Guide: *Exploring The High Arctic From Your Classroom;* teachers from all around the world used it as a guide in teaching lessons about the North Pole. With the help of amateur radio operators, thousands of school children heard the DIGITALKER aboard UoSAT-OSCAR-11 as it "spoke the position" of the Skitrekers as they made their way across the North Pole. In addition to the Teachers Guide, Rich also generated a week-

ly progress report on the status of the trekers and he made sure that the reports arrived in a timely manner to teachers who were involved in this program. The ARRL Board of Directors recently recognized Rich for his efforts in this endeavor. Also, Rich's colleges have likewise recognized him -- he was voted "Teacher of the Year" at Crestwood High School in Dearborn Heights, MI. AMSAT-NA congratulates Rich and feels the recognition he has received is very much deserved. Here is the text of the League's letter:

Dear Rich:

It gives me great pleasure to advise you of the following action by the ARRL Board of Directors at its meeting last week:

RESOLVED that the ARRL Board of Directors, in meeting assembled, expresses its appreciation and congratulations to AMSAT, and particularly to Rich Ensign, N8IWJ, for the innovative and effective way in which SKITREK was used to bring Amateur Radio to the attention of thousands of young people in classrooms throughout the US and Canada.

Great job, Rich

Sincerely,

David Sumner, K1ZZ
Executive Vice President
American Radio Relay League, Inc.

Satellite Hints: The OSCAR Letter - No. 12

If you use an antenna switch, get a good high isolation low loss switch like the DAIWA CS-201G. RF from your omni leaking through could raise your noise floor. Make sure it has N connectors and that it is rated for the frequency you are using it on. Isolation decreases as the frequency increases.

If you use your 2m and/or 435 MHz for both xmit and receive, use an RF switched preamp. It's *very* easy to accidentally xmit through the preamp and kill the GaAsFET. I've spent enough on repairs to my GaAsFET to have purchased an RF switched preamp. It's worth the 0.5dB loss in the relays for the additional protection.

However, *Do Not Rely* on RF switching circuits to protect your GaAsFET preamp. RF travels a lot faster than a mechanical relay can switch. Therefore, something must be absorbing the RF before the relay switches. Hardwire switch the preamp. Use RF switching as a backup, not as the primary switching circuit.

If you use an antenna switch, use a low loss, high isolation switch with N connectors that is rated for UHF (or the appropriate frequency you use). A switch with low isolation will result in RF noise and signals, from your other antenna(s) getting into your receiver and raising your noise floor. I reduced my noise floor 1-2 S-units when I replaced an old Heathkit HF coax switch with a DAIWA CS-201G.

Courtesy *AMSAT-UK OSCAR News*

Short Bursts

•AMSAT-NA wishes to express its most sincere appreciation to JAMSAT for the donation of $6,000. The donation was made in the form of a check presented by JAMSAT at the General Meeting and Sixth Annual Space Symposium banquet on November 12, 1989, in Atlanta, GA. Our warmest thanks to JAMSAT for their continued support.

•AMSAT Phase IV Design Team Member Dick Jansson, WD4FAB, wrote the chapter on space communications in the current edition of *The ARRL Handbook*. Dick is now updating the text for the next edition. Among other changes he's including, will be a significant expansion of the material concerning getting on Mode L (uplink at 1269 MHz/downlink at 436 MHz). If you have any suggestions for Dick on how the chapter can be further improved, please let him know: Dick Jansson, WD4FAB, 1130 Willowbrook Trail, Maitland, FL 32751.

•OSCAR satellite enthusiasts are reminded of the new AMSAT "Novice/Technican" Net every Sunday at 1900 UTC at 28.460 MHz. This weekly net is conducted by Vinnie, WB2YGA. This net is intended for helping beginners get started on OSCAR satellites. WB2YGA reported for his first session of this "Novice/Technican" Net that he had over twenty check-in! Vinnie requests that those looking for him on Sundays at 1900 UTC consider the effect that QRM will have on his start-up frequency -- look around 28.460 MHz. All newcomers and "old pro's" are welcomed to join help make this an informative net for all.

•A new AMSAT Net Directory is being compiled and if you conduct an AMSAT Net that is currently not registered, contact Wray Dudley, W8GQW, at (602) 398-9380. If you are interested in starting a VHF/UHF Net in your local area, help and information are available from W8GQW.

•Dr. Dave Filmer, WB9QPG, has been appointed as Regional Coordinator for the Great Lakes Region. The Great Lakes Region consists of the states of Michigan, Ohio, Indiana, Illinois, and Wisconsin. Dave replaces Larry Koziel, K8MU, who has resigned due to increased travel requirements on his job. We will miss Larry, but we would also like to extend a special welcome to Dave Filmer to the AMSAT-NA Field Operations Team.

•Ron Curry, WA4GSS, has been appointed as Regional Coordinator for the Mid-South Region, consisting of the states of Kentucky, Tennessee, Mississippi, and Alabama. Ron replaces Mac Jordan, W4DAQ, who has resigned due to family health reasons. Mac served well as Regional Coordinator and we are sure Ron will follow in his footsteps. Welcome Ron!

•Roy Robinson, K4EDU, has assumed the important responsibilities of primary Net Control Station (NCS) for the Tuesday Night East Coast 75 Meter Net. Roy will continue the tradition of disseminating the latest news concerning the Amateur Radio Satellite Program with this popular net. Byron Lindsey, W4BIW, will serve as a back-up NCS.

•The May issue of *73 Magazine* will be entirely devoted to Amateur Radio satellites. Papers and articles from around the world will discuss the technical and operation aspects of OSCAR satellites. Arrangements are being made for AMSAT members who are not *73 Magazine* subscribers to purchase the May issue through our headquarters.

•UoSAT-OSCAR 9 has four phase-referenced HF beacons which can be used for propagation studies. Due to the non-deployment of the gravity gradient boom, which also is used as an HF antenna, the operational performance was not as expected. In fact, only the 21 MHz beacon has been operational. As a test, the 14 MHz beacon was switched on again a few months ago, and recently the 28 MHz beacon as well. Several monitoring stations have confirmed reception of the three HF beacons with signals stronger than expected. The beacons transmit 12 wpm Morse Code on 14.002, 21.002, and 29.502 MHz. The data content consist of the first 10 channels of telemetry (TLM), followed by the word "AMSAT" and tone-mode. If you have successfully monitored any of these beacons, please report your results to an AMSAT-NA Net Control Station. (Thanks *AMSAT-UK OSCAR News)* NOTE: This satellite may possibly de-orbit and re-enter the Earth's atmosphere later this year. Its altitude is decreasing by several kilometers every week.

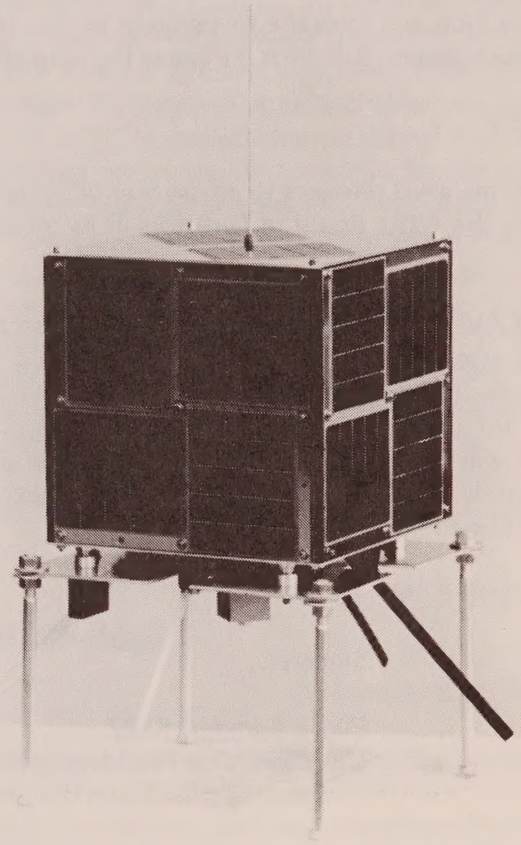
•OSCAR-13 Spacecraft Attitude Adjustment & Transponder Schedule Change, according to Dave Cowdin; There was a AO-13 spacecraft attitude reorientation maneuver which took place on March 15 in order to make adjustments for seasonal changes in sun angles. As with all attitude re-adjustments, there was also a transponder operating schedule change. Effective March 15, 1989 the Operating Schedule for AO-13 is as follows:

Mode-B	from MA 100 until MA 160
Mode-JL	from MA 160 until MA 200
Mode-B	from MA 200 until MA 255
OFF	from MA 0 until MA 100

At the present time there is no scheduled Mode S operating time but it is expected that this will change after RUDAK testing is finished. Listen to the Beacons on AO-13 and AMSAT Nets for the latest information on any operating schedule changes. The above operating schedule will remain in effect until May 3, 1989.

•If you would like a quicker update to the Keplerian elements of UO-9 than are provided by NASA, you are invited to call the NYØOT BBS. Keith Goobie, NYØOT/VE3PDD, an AMSAT-NA Area Coordinator for the Southern Colorado Area, is a Captain in the Royal Canadian Air Force who is presently stationed at the North American Air Defense Command (NORAD) in Colorado Springs, CO. Keith will be putting the latest elements for UO-9 on his BBS as he receives them from NORAD each day. So for daily updates on UO-9, call the NYØOT BBS at 719-637-1375.

•Mike Parisey, WDØGML, the System Manager for the AMSAT-NA BBS, asks users to avoid using the BBS on Sundays between 1730 UTC and 1900 UTC. Mike indicates that RFI problems from his HF operations of the AMSAT 20-meter net disrupts the BBS and makes it impossible to down-load the AMSAT News Service Bulletins. The BBS is available 24 hours a day, seven days a week (except as mentioned above) at 314-447-3003.



AMSAT-NA MicroSat bus, seen here on a mounting plate, is a cube 23 cm (9 inches) on a side and weighing 10 kg. (22 lbs.) The standard bus can be outfitted with various specific payloads such as packet radio transponders, CCD cameras, etc. (AMSAT-NA photo by Dick Jansson, WD4FAB)

Bill Eitel — Silent Key

The March 6, 1989 edition of Defense News carried an obituary notice of the death at 81 of William Eitel, described as a Radio Amateur enthusiast and co-founder of one of Silicon Valley's earliest technology companies.

Bill Eitel, WA7LRU/W6UF/W6AY, who with a partner, founded the Eitel-McCullough (EIMAC) company, will be remembered by many as a long-term, active and enthusiastic member of the Amateur Radio community. An early participant in the Amateur Radio satellite program, Bill was active with the Project OSCAR group in the 1960's and, as Life Member No. 9, provided strong personal and financial support for the AMSAT programs in the early 1970's. From 1972 to 1975, he served as chairman of the Amateur Satellite Service Committee (ASSC), a coordinating body with representation from Project OSCAR, AMSAT, and the ARRL. In this position, he undertook a number of initiatives aimed at garnering support for the amateur satellite program from the highest levels in government.

Bill was not as active in the past several years due to failing health, but continued to take a strong interest in the program. He will be missed.

Dove: A MicroSat Classroom Messenger

by Rich Ensign, N8IWJ

Sometime in early-to-mid 1989, four 23 centimeter (9 inch) cubes will be injected into an 800 km circular Earth orbit by an Ariane launch vehicle. Known as MicroSats, these tiny Amateur Radio satellites include the latest innovations in communications and computer technology. They will pass over all parts of the world in polar orbits. The MicroSat known as DOVE is designed with educational purposes in mind

DOVE is an acronym for Digital Orbiting Voice Encoder. DOVE is sponsored by the Brazilian Radio Amateur Satellite Organization, BRAMSAT. Dr. Junior Torres de Castro, President of BRAMSAT, heads the DOVE project. As it circles the world, the satellite will transmit digitized voice messages along with spacecraft information. DOVE's educational focus will allow it to be used in ways that cut across subject matter boundaries. Physics, astronomy, electronics, geography, and language arts classrooms can all make creative use of the signals from DOVE. The satellite can also be used at many educational levels from early elementary school through high school. A New Zealand kindergarten teacher, now studying for her Amateur Radio license, even plans to use DOVE in a tape-assisted reading program. DOVE's special voice synthesizer capabilities will allow schools with Amateur Radio interests to use it as a vehicle for sharing on a worldwide basis.

DOVE's computer keeps watch over the satellites condition and can inform students and teachers as to how it is functioning. DOVE will tell us its temperature, electrical condition, whether it's in sunlight or darkness and even its spin rate. This information, called telemetry, can prove very useful in giving students some idea as to the conditons under which an orbiting spacecraft operates. Telemetry will be read out in English and will alternate with other DOVE activities. DOVE will transmit on a frequency of 145.970 MHz with a power of up to 4 watts. DOVE's downlink signal will be easily picked up on the ground by simple scanner/receivers with whip antennas or by Amateur Radio gear. Most schools will be able to clearly receive the signal right in the classroom. Satellite passes will occur at about 10:30 AM and 10:30 PM local time. The morning pass will, of course, occur during the school day.

Once DOVE is launched and activated, a PROJECT DOVE Teacher's Guide, now in production, will be made available to schools wishing to integrate this unique teaching tool in orbit into the science, social studies and language arts areas of the curriculum

Read My Lips: No More Hype!

by Ray Soifer, W2RS

A plea to prospective authors of articles for the popular Amateur magazines about forthcoming satellites: Please, guys, no more hype!! (I have not read anyone's MicroSat article, so no one should take this personally).

Not too many years ago, AMSAT ran a series of fund-raising ads which trumpeted loudly that "Phase III would be the equivalent of a new band!" Well, when we finally got AO-10, there was a launch accident, the inclination was much lower than expected, an antenna was bent or broken and it was a new band, all right, if you didn't mind limited access time and weak signals. AMSAT lost more credibility with the general Amateur community over those impossible-to-fulfill early promises than over anything we've ever done before or since. The letdown in the VHF/UHF world in the first few weeks of AO-10's operation will never be forgotten by anyone who lived through it.

Then, there was FO-12 and the battery problem, not to mention the fact that most Hams had been led to believe that they could access Mode JD with a standard TNC-2. Sure, they could, if they had a special modem that to this day is available only in kit form.

Dare I mention AO-13 and the "squint angle" problem that means that its maximum effective range is a good deal less than that of AO-10? What about Mode J that was featured in pre-launch publicity and that many Amateurs are now told not to use?

Dear reader, I am not complaining about the satellites. They represent the best that their designers and builders could have done under the circumstances. Ours is an experimental, not an operational service, and all of the above spacecraft were successful experiments from which we have learned things that will help us in the future.

Rather, my complaint is about the pre-launch publicity that was based on the designer's hopes and specifications rather than on the actual post-launch performance. As I have illustrated above, we have often misled people about what our products could do for them. We did that with the best of intentions, but the "product liability" we now face is a great deal of skepticism about anything in the way of publicity that comes out with our name on it. Believe me, some of that will come back to bite us on the no-code issue.

In an ideal world, I would suggest holding up publication of user-tutorial articles until after satellites are up and running. In this day of 3-5 year useful spacecraft lives, we can afford the luxury of a few months at the outset to see that we get the story straight. Such a policy would not make editors and publishers love us, but I'd rather that their readers learn to trust us again.

When that ideal is not possible, let's everyone who writes these things go through his manuscript with a tough eye and take out anything that even so much as smells like a promise of performance. Sure, fewer people will be "motivated" to read the article that way. But, I'd rather they be motivated to trust AMSAT in the future. Then, after the spacecraft has been tested in orbit, we can run a second article about how good it is.

Note that I have observed my own rule; I waited at least several billion years before publishing my *QST* article about OSCAR Zero.

Tucson Amateur Packet Radio 1989 Annual Meeting

By Andy Freeborn, NØCCZ

The seventh annual Tucson Amateur Packet Radio membership meeting concluded a one and one-half day ses-

sion on Sunday, February 26th in Tucson. There was a full agenda of speakers making presentations on digital, RF, networking and satellite work in progress. On the Friday preceding the annual meeting the TAPR Board of Directors met.

The evidence of cooperation between sister organizations AMSAT and TAPR was never more apparent than at this annual meeting. Several key AMSAT officials were present and the program agenda leaned heavily toward briefings on the AMSAT MicroSat satellites scheduled for launch later this year.

The fact that the first MicroSats will be space based packet radio links has presented development challenges that call upon the unique talents of each organization. Several of the key players in AMSAT's MicroSat development program are dual-hatted as members of both the TAPR and AMSAT Boards of Directors. TAPR has contributed $21,300 toward development costs of the AMSAT-NA MicroSat. In addition, TAPR parts procurement sources are being used to acquire many of the needed electronic components.

The eight and one half hour Saturday session started at 0900. TAPR board members Dr. Tom Clark, W3IWI, and Harold Price, NK6K spoke on MicroSat topics. Both Harold and Tom have been active for many years in AMSAT satellite development efforts. TAPR member Jon Bloom, KE3Z, described the MicroSat Power Module being developed in the ARRL lab. AMSAT's VP for Engineering and MicroSat Chief Jan King, W3GEY, displayed and described a full scale MicroSat satellite. Other key AMSAT players present were AMSAT-NA President Doug Loughmiller, KO5I, and Brazil AMSAT President Dr. Junior DeCastro, PY2BJO. Lyle Johnson, WA7GXD, long time former TAPR President and a key MicroSat developer was out of the country on business and unable to attend. Also unable to attend was Dr. Bob McGwier, N4HY, a former TAPR board member, present AMSAT board member and key MicroSat developer.

The wide variety of other topics presented gave a good representation of the interests and activities of TAPR members. These presentations covered TCP/IP, TexNet, HF BBS Networks, no-code license, 1200 MHz transverter, microwave ethernet, the K3MC I/O board, the 56 kbps modem, modem demodulation experiments, TAPR hardware projects, 10 GHz EME and recent ARRL actions of interest.

The Sunday session of 3-1/2 hours was devoted exclusively to discussion of a no-code license. It was a lively and constructive discussion and TAPR no-code committee chairman Harold Price accumulated a great deal of valuable input from the membership.

Re-elected TAPR President Andy Freeborn, NØCCZ, announced the results of balloting for the five vacant Board of Director seats. Re-elected to the board were Steve Goode, K9NG, Eric Gustafson, N7CL, and Lyle Johnson, WA7GXD. New members to the board are Bdale Garbee, N3EUA, and Franklin Antonio, N6NKF. In addition to Freeborn the new officers are Pete Eaton, WB9FLW as Executive Vice President, Dave Toth, VE3GYQ as Secretary and Bdale Garbee, N3EUA, as Treasurer.

Paul Williamson, KB5MU, from the SANDPAC Newsletter prepared a comprehensive "Blow-by-Blow Report of the 1989 TAPR Annual Meeting." This excellent 13-page summary of each talk can be obtained from the TAPR office by sending $1.50 to the TAPR office to cover printing and mailing expense (TAPR, Box 12925, Tucson AZ, 85732).

Update on UoSAT and UoSAT-E Projects

Dr. Martin Sweeting, G3YJO

Two UoSAT-D and UoSAT-E spacecraft are being assembled by the UoSAT team at the University of Surrey, ready for a launch on ARIANE-4 currently scheduled for July 1989. UoSAT-D & E will be accompanied by four AMSAT-NA MicroSats, and will be placed underneath the primary SPOT-2 payload around the new Ariane ASAP structure (Ariane Structure for Auxiliary Payloads) - specially designed to provide small secondary payloads with inexpensive launch opportunities.

The UoSAT-D & E spacecraft will support:

- Amateur Radio packet store-and-forward communications transponder,
- studies of the orbital radiation environment,
- in-orbit demonstration and evaluation of novel spacecraft technologies,
- further development of low-cost CCD Earth imaging techniques.

Progress

Structure:

The spacecraft body comprises stacked identical modules, each of which has been designed and manufactured at UoS using a computer-aided design and manufacturing process. The engineering modules have been delivered and vibration tested. The flight structures are in fabrication.

Electronics:

Based on prototypes, engineering models of modules are in various stages of layout, assembly and test. The engineering model Packet Communications Experiment (PCE) and the OBC are working well. The flight model of the attitude determination magnetometer is being assembled.

The most difficult problem experienced thus far has been with the laying down of the KAPTON insulating layer necessary between the aluminum skin of the solar array panel and the GaAs solar cells. The lay-down difficulties have been solved, but the adhesive has caused problems during extreme thermal vacuum tests. Further tests are in progress.

Launch:

There have been several visits to UoS by the ARIANESPACE and SPOT teams to discuss launcher interfaces and procedures, and G3YJO visited the launch site at Kourou to check facilities and plan the launch campaign. UoSAT are also handling the ARIANESPACE launch servies on behalf of the AMSAT-NA MicroSats.

Information:

The UoSAT team are working hard to prepare two UoSAT spacecraft for launch by July 1989 — please be patient concerning the availability of information. We shall release it as soon as specifications have been checked and confirm-

ed on the flight models. We shall try to provide as much advance information and photos as we can through *OSCAR News* and watch the UO-11 Bulletins for further details on UoSAT-D & E.

Courtesy *AMSAT-UK OSCAR News*

MicroSat Progress Report #1: Mechanical and Electrical Assembly Tasks Going Well

Jeff Zerr, AMSAT-NA's Engineer-in-Charge of Mechanical Assembly, presents the first of a series of brief progress reports which are intended to keep AMSAT members informed of the progress being made in building the four MicroSat satellites to be launched this summer. The following are the "highlights" of the progress made up to this point:

1) The aluminum frames which make up the modules are completed and are being fit checked and final machining is being accomplished. Holes are being drilled for 25 pin D subminiature connectors.

2) Solar cells are being glued to the honey-combed aluminum side panels and the wiring connecting the solar cells will start this week.

3) Jon Bloom, KE3D, of the ARRL, is completing the Printed Circuit Board (PCB) layout design for the Battery Charge Regulator (BCR) and he will be sending it to Boulder, CO next week for a fit check.

4) Matjaz Vidmar, YT3MV, who is a Fullbright Scholar at Colorado University and is assisting AMSAT-NA, is putting the finishing touches on the PCB layout for the BPSK Packet Transmitters. Also, Matjaz is working on the design of a Mode S module which is being considered as an additional transmitter for the packet "store-and-forward" MicroSats.

5) Bob Stricklin is finishing the PCB's for the Addressable Asynchronous Receiver Transmitter (AART). The AART acts as a computer "bus" between the modules and was conceived as a way of minimizing the number of wires in satellites.

6) The batteries for all the MicroSats are being shipped from Ottawa, Canada next week to Boulder, CO for installation into their "cradles." Larry Kayzer and Stan Kasmeric in Ottawa are doing the battery testing and the charging and battery matching tasks. Dick Sunderland will perform the mounting of the batteries into their "cradles" in the power modules. The power modules and the "cradles" are being built by Craig and Tom Stevens.

7) Tom Clark, W3IWI, and Dick Daniels, W4PUJ, are doing the receiver design and the PCB layouts in the Washington, DC area.

8) Tom McIntyre in Iowa is doing the "delren" mechanical block design and construction; the mechanical blocks are designed to provide a "platform" to mount the PCB's in the aluminum frames. Delren is a special kind of "teflon" material used in spacecraft and is easy to work with.

In considering each of these tasks, keep in mind that they must be done four times! The "target" date for the final mechanical assembly and electrical "check-out" of *all* of the MicroSats is being planned for the mid-April time frame. AMSAT-NA is working toward a launch date of June 15, 1989.

G4JUJ Program Calculates Gain

This program developed by G4JUJ calculates the erp. & eirp. for any quantity of aerials providing they are in phase and spaced for maximum gain.

```
  10*K.100.!MRUN!M
  20CLS
  30PRINTTAB(0,2)"This program calculates the erp. & eirp."
  40PRINTTAB(0,3)"for any quantity of aerials providing"
  50PRINTTAB(0,4)"they are in phase and spaced for maximum"
  60PRINTTAB(0,5)"gain."
  62PRINTTAB(5,7)"By G4JUJ 4th. January 1989."
  65PRINTTAB(5,8)"--------------------------"
  70PRINT
  80INPUT"Aerial Gain dBd. ",GN
  90INPUT"Quantity of aerials ",QTY
 100INPUT"Feeder Loss dB. ",FL
 110INPUT"Power W. ",PWR
 120PRINT
 130Q=LOG(QTY)*10
 140X=(GN+2.15+Q-FL)/10:X=10↑X:Xi=(X*PWR):Xe=Xi/1.640589773
 150PRINT"Ans= "Xe" W. erp."
 160PRINT
 170PRINT"Ans= "Xi" W. eirp."
 180IFXi<1667THENPRINTTAB(4,19);CHR$(129);CHR$(136)"NOT
ENOUGH FOR RELIABLE PH3."
 190IFXi<1667THENPRINTTAB(4,20);CHR$(129);CHR$(136)"-------
----------------------"
 200PRINT
 210PRINT"Another? Y/N"
 220IF GET$="Y"THEN GOTO 20
```

AMSAT Orbital Elements for OSCAR Satellites from W0RPK, MAR. 28, 1989

Satellite	***UO-9***
Catalog number	12888
Epoch time:	89077.80682747
Element set:	490
Inclination:	97.5720 deg
RA of node:	126.3722 deg
Eccentricity:	0.0002614
Arg of perigee:	107.3943 deg
Mean anomaly:	252.4805 deg
Mean motion:	15.48064947 rev/day
Decay rate:	6.9475e-04 rev/day²
Epoch rev:	41495

Satellite	***FO-12***
Catalog number	16909
Epoch time:	89067.55289774
Element set:	133
Inclination:	50.0189 deg
RA of node:	247.6702 deg
Eccentricity:	0.0011159
Arg of perigee:	89.9444 deg
Mean anomaly:	270.2664 deg
Mean motion:	12.44398451 rev/day
Decay rate:	-2.5e-07 rev/day²
Epoch rev:	11687

Satellite	***AO-10***
Catalog number	14129
Epoch time:	89070.49271510
Element set:	389
Inclination:	26.5524 deg
RA of node:	275.5927 deg
Eccentricity:	0.6074543
Arg of perigee:	24.7104 deg
Mean anomaly:	355.1329 deg
Mean motion:	2.05881509 rev/day
Decay rate:	-3.6e-07 rev/day²
Epoch rev:	4320

Satellite	***AO-13***
Catalog number	19216
Epoch time:	89066.48753782
Element set:	31
Inclination:	57.2987 deg
RA of node:	217.0442 deg
Eccentricity:	0.6676889
Arg of perigee:	200.1058 deg
Mean anomaly:	111.0424 deg
Mean motion:	2.09707010 rev/day
Decay rate:	-8.1e-07 rev/day²
Epoch rev:	560

Satellite	***UO-11***
Catalog number	14781
Epoch time:	89073.14050688
Element set:	417
Inclination:	98.0197 deg
RA of node:	134.6837 deg
Eccentricity:	0.0012496
Arg of perigee:	261.4704 deg
Mean anomaly:	98.5268 deg
Mean motion:	14.63126659 rev/day
Decay rate:	2.569e-05 rev/day²
Epoch rev:	26864

Satellite	***RS-10/11***
Catalog number	18129
Epoch time:	89079.05754797
Element set:	702
Inclination:	82.9259 deg
RA of node:	304.0023 deg
Eccentricity:	0.0010606
Arg of perigee:	303.6905 deg
Mean anomaly:	56.3207 deg
Mean motion:	13.71957111 rev/day
Decay rate:	6.08e-06 rev/day²
Epoch rev:	8717

Orbital Elements for Weather Satellites

Satellite	*MET-2/16*
Catalog number	18312
Epoch time:	89080.53951016
Element set:	251
Inclination:	82.5541 deg
RA of node:	288.9898 deg
Eccentricity:	0.0013806
Arg of perigee:	81.8702 deg
Mean anomaly:	278.4034 deg
Mean motion:	13.83446049 rev/day
Decay rate:	3.62e-06 rev/day²
Epoch rev:	8039

Satellite	*MET-2/17*
Catalog number	18820
Epoch time:	89080.99609503
Element set:	95
Inclination:	82.5412 deg
RA of node:	349.8408 deg
Eccentricity:	0.0016659
Arg of perigee:	151.4112 deg
Mean anomaly:	208.8157 deg
Mean motion:	13.84127593 rev/day
Decay rate:	6.26e-06 rev/day²
Epoch rev:	5762

Satellite	*MET-3/2*
Catalog number	19336
Epoch time:	89080.99942882
Element set:	154
Inclination:	82.5412 deg
RA of node:	237.3532 deg
Eccentricity:	0.0018434
Arg of perigee:	37.9830 deg
Mean anomaly:	322.2461 deg
Mean motion:	13.16854787 rev/day
Decay rate:	3.91e-06 rev/day²
Epoch rev:	3143

Satellite	*NOAA-9*
Catalog number	15427
Epoch time:	89076.93585771
Element set:	345
Inclination:	99.1373 deg
RA of node:	62.1303 deg
Eccentricity:	0.0014880
Arg of perigee:	206.6706 deg
Mean anomaly:	153.3703 deg
Mean motion:	14.11902595 rev/day
Decay rate:	1.711e-05 rev/day²
Epoch rev:	21957

Satellite	*NOAA-10*
Catalog number	16969
Epoch time:	89078.22025078
Element set:	205
Inclination:	98.6498 deg
RA of node:	110.3998 deg
Eccentricity:	0.0014082
Arg of perigee:	147.6243 deg
Mean anomaly:	212.5813 deg
Mean motion:	14.22885227 rev/day
Decay rate:	1.355e-05 rev/day²
Epoch rev:	13114

Satellite	*NOAA-11*
Catalog number	19531
Epoch time:	89078.21452833
Element set:	58
Inclination:	98.9305 deg
RA of node:	22.7023 deg
Eccentricity:	0.0013344
Arg of perigee:	123.6682 deg
Mean anomaly:	236.5795 deg
Mean motion:	14.10885239 rev/day
Decay rate:	1.279e-05 rev/day²
Epoch rev:	2478

AMSAT Orbital Elements for Manned & Misc. Satellites

Satellite	*MIR*
Catalog number	16609
Epoch time:	89080.39453676
Element set:	749
Inclination:	51.6237 deg
RA of node:	83.8266 deg
Eccentricity:	0.0010939
Arg of perigee:	140.2602 deg
Mean anomaly:	219.7953 deg
Mean motion:	15.71240974 rev/day
Decay rate:	5.7652e-04 rev/day²
Epoch rev:	17748

Satellite	*SALYUT-7*
Catalog number	13138
Epoch time:	89079.63530820
Element set:	483
Inclination:	51.6116 deg
RA of node:	30.1945 deg
Eccentricity:	0.0002304
Arg of perigee:	91.0016 deg
Mean anomaly:	269.1765 deg
Mean motion:	15.38753796 rev/day
Decay rate:	-5.607e-05 rev/day²
Epoch rev:	39454

Satellite	*AJISAI*
Catalog number	16908
Epoch time:	89038.17532047
Element set:	117
Inclination:	50.0133 deg
RA of node:	337.7587 deg
Eccentricity:	0.0011308
Arg of perigee:	16.5812 deg
Mean anomaly:	343.5388 deg
Mean motion:	12.44375026 rev/day
Decay rate:	-3.3e-07 rev/day²
Epoch rev:	11322

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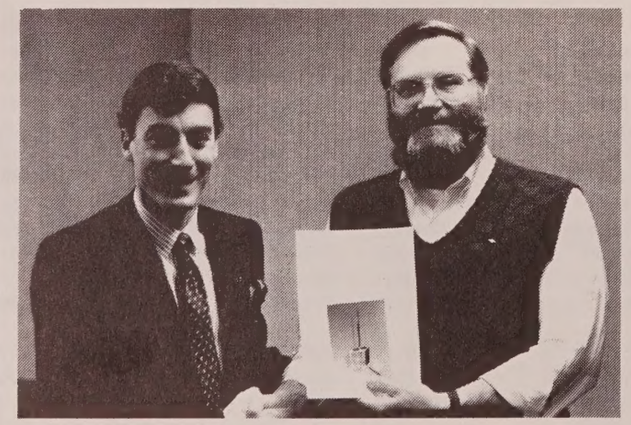

Dr. Alberto Zagni, I2KBD. Vice President of AMSAT-Italy and Dr. John Champa, K8OCL, AMSAT-NA Executive Vice President exchange a letter from Alberto to the Italian-American Club of Detroit, of which John is a member. Alberto was in the U.S. discussing items of mutual interest with John about AMSAT's Telemail system, the MicroSat Program, etc. (Photo:WA5ZIB)

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